

## ECOLOGICAL RESEARCH ON AVIFAUNA OF RESERVOIRS IN THE MIDDLE OF ARGES VALLEY. THE AUTUMNAL SEASON

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**Key words:** birds, autumnal season, Argeș River

### INTRODUCTION

The beginnings of the research on the aquatic avifauna of the reservoirs created in the upstream or midstream regions are due to Dan Munteanu (1961-1966), who continued his work together with Mătieș (1969-1982). In their study „*Modificări induse de lacurile de acumulare în structura și dinamica avifaunei*” (“*Changes Induced by Basins in the Structure and Dynamics of the Avifauna*”, 1983), Munteanu and Mătieș presented a synthesis of the changes that had taken place in the structure and dynamics of the avifauna due to the modifications in the Argeș River basin. Since 1999, the avifauna was intensively studied, numerous articles have been published, especially regarding the Vâlcele-Golești area, which later became a component of the Nature 2000 network, ROSPA0062 – *Lacurile de Acumulare de pe Argeș* [Gava, 1997; Conete et al., 2008; Mestecăneanu et al, 2013; Conete, 2011; Conete, 2013; Conete & Dorobăț, 2017; Conete, 2017].

### MATERIALS AND METHODS

The Argeș River, with 344 km long and 12 550 km<sup>2</sup> surface of his hydrographical basin, is a water course in the S-SE of Romania [Barco & Nedelcu, 1974] (Fig. 1). 60 years ago, on his course a series of basins was built: Vâlcele (408 ha), Budeasa (412 ha), Bascov (162 ha), Pitești (122 ha) și Golești (649 ha) (Fig. 2) [Conete, 2011]. Newly created lakes have a significant impact on the landscape, influencing both the spatial and the temporal composition and dynamics of the birds' species in the area.

The studied area is highly significant, as the middle basin of Argeș River is an extension of the Rucăr – Bran migration Corridor, one of the corridors used by the migrating birds in order to get across the Meridional Carpathians [Mătieș, 1969; Gava, 1997; Conete, 2011].

During the last 50 years, the surface of wetlands has been reduced by approximately 80%. In this context, the artificial wetlands can contribute to preserving biodiversity [Zhijun, M. et al., 2004; Conete, 2011]. Numerous bird species can be affected in the study area due to anthropic pressure,

degradation and fragmentation of the habitats, due to climate changes [<http://www.iucnredlist.org/>; Conete, 2018]. Concrete actions are needed from the local community, of the legal institutions, from competent and dedicated people towards the conservation of the natural inheritance [Munteanu D., 2009; Conete, 2018].

The study area includes one of the most important aquatic ecosystems in the Argeș Valley, significant areas for wintering (agglomerations of aquatic birds), significant feeding, passage and nesting locations for many bird species (Fig. 2).



Fig. 1. The middle basin of the Argeș

The characteristic climate of the area is temperate-continentl with cold winters and warm summers with hilly characteristics [Barco & Nedelcu, 1974]. The vegetation in the area of the lakes is specific to the southern hilly area. The hills are covered by deciduous forests, orchards and agricultural plots. The vegetation in the area of the lakes is represented by *Phragmites sp.*, *Typha sp.*, *Carex sp.*, *Juncus sp.*, *Salix sp.*, *Alnus incana*, *Populus alba*, *Rosa canina*, *Rubus sp.* etc. The process of silting (especially in the area of Pitești and Bascov Lakes) permitted the establishment of the reedbeds and of the other typical wetland plants. There are also plantations of locust tree and pine trees in the area.

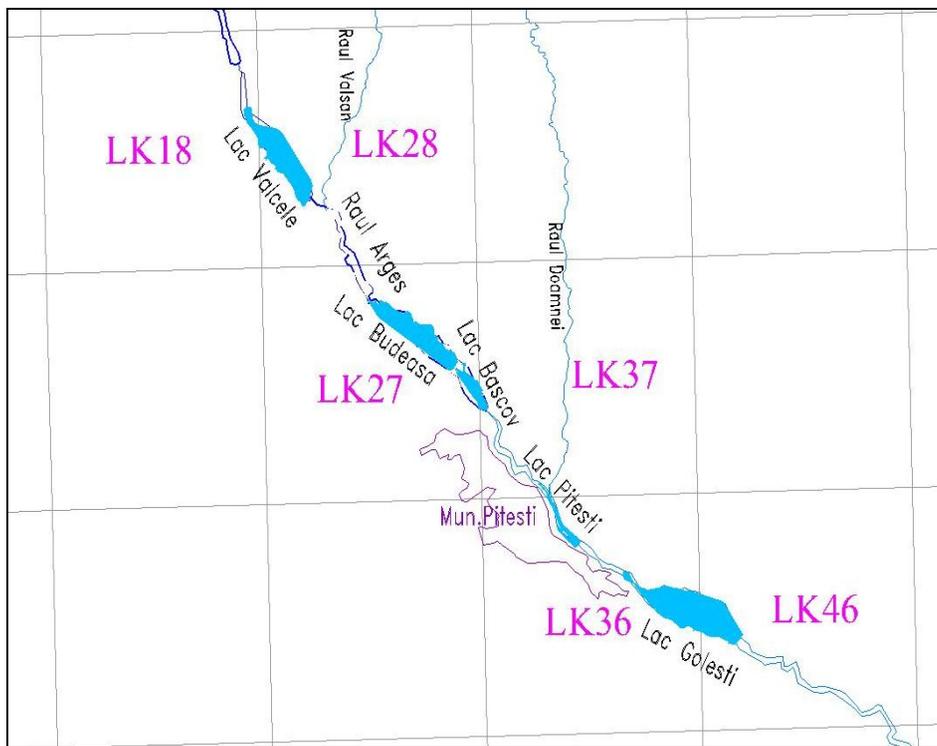


Fig. 2. The division of the middle basin of Argeș in 10x10 km<sup>2</sup> areas according to the UTM (Universal Transverse Mercator) network and their numbering (after Lehrer & Lehrer, 1990 – modified Conete, 2011)

The attractiveness of the five reservoirs for the avifauna is different and dynamic, being firstly conditioned by their surface (the size of the water table, water level, etc), the warping degree and also by the heterogeneity of the habitats (meadow, grasslands, shrubbery, agricultural surfaces, orchards, deciduous forests) from the proximity of the studied lakes [Alexiu, 2008; Conete, 2011].

Research in the field had been permanently made on these lakes and around them, starting with February 2003 until 2011, covering all of the six phenological seasons, but this paper only approaches the autumnal issue. Quantitative ecological research followed the communities of birds in the wetlands, open habitats (grasslands and shrubbery) and forest habitats at the margins of the lakes and built-up areas.

We have used the following methods: the itinerary (routes alongside the banks and the dams) method, the fixed point of observations and also the moving observations within the lakes and rush beds, sometimes using the boat. We used 10x50 binoculars and a 20-60x80 scope. Auditory observations were also made. The birds were identified with the Hamlin Guide [Bruun et al., 1999]. The autumnal aspect includes the second half of September and the whole October.

## RESULTS AND DISCUSSION

Regarding the autumnal aspect, during the research, in the area of the reservoirs from the middle basin of Argeș river, we have identified 147 species (71.01% of the total identified avifauna in the area), belonging to 14 orders, 39 families and 91 genres, and the most representative from the perspective of numbers is the order Anseriformes; 57 species depend on the wetlands this season.

This season is featured by more accelerated dynamics, the migration started in the serotinal season continues, the summer guest species are leaving the area in the favor of the wintering guests and the passing species. During the autumnal season, autumn migration specific agglomerations are present.

Though the number of species is lower reported to the serotinal season, the number of individuals is much higher. Autumn migration happens much lower than the spring one, as birds use for a longer time the territories that offer them abundant feeding living resources and shelter. Ample migrations from a lake to another can also be observed during this season.

Regarding the taxonomic classification, the avifauna of the autumnal season is represented of the following orders: Passeriformes (66 species),

Charadriiformes (18 species), Anseriformes (14 species), Falconiformes (11 species), Piciformes (9 species), Ciconiiformes (6 species), followed by Podicipediformes and Gruiformes with four species, then come the Pelecaniformes, Columbiformes, Strigiformes and Coraciiformes with three species, Galliformes (2 species) and Gaviiformes with a single species. We notice that, during the autumnal season, the number of orders decreases compared to the one in the serotinal season (17 Orders), but the number of species in the Anseriformes Order is superior to the one in the serotinal season (11 species) [Conete, 2017].

Within the analysis of the autumnal season, we observe, on the whole, that the order Anseriformes, overpassing by far the other orders from the perspective of the  $I_R$  values, was overdominant, and the orders Passeriformes, Gruiformes and Charadriiformes were dominant, while the other orders (Pelecaniformes, Podicipediformes, Ciconiiformes, Falconiformes, Coraciiformes, Columbiformes, Strigiformes, etc.) were complementary (Table 1; Fig. 3).

Most of the aquatic birds are grouped in flocks, which come together in the case of limicoles hundreds of individuals or several thousands in the case of Anseriformes – agglomerations of Anseriformes (*Anas platyrhynchos*, *Anas crecca*, *Aythya ferina*, *Anser albifrons*, *Cygnus olor*, etc.) which justifies the very high value of the  $I_R$  for Anseriformes (54.31) during the autumnal season (Table 1).

Table 1. The values of the index of relation  $I_R$  for the orders of birds identified in the area during the autumnal season

No.	Orders	Participation
1.	<b>Gaviiformes</b>	0,01
2.	<b>Podicipediformes</b>	2,30
3.	<b>Pelecaniformes</b>	6,34
4.	<b>Ciconiiformes</b>	0,38
5.	<b>Anseriformes</b>	54,31
6.	<b>Falconiformes</b>	0,17
7.	<b>Galliformes</b>	0,09
8.	<b>Gruiformes</b>	12,35
9.	<b>Charadriiformes</b>	10,44
10.	<b>Columbiformes</b>	0,29
11.	<b>Strigiformes</b>	0,02
12.	<b>Coraciiformes</b>	0,05
13.	<b>Piciformes</b>	0,11
14.	<b>Passeriformes</b>	13,15

Waterbirds are attracted to the researched area especially by the existing trophic offer and also by the resting places. Therefore, during the autumnal season, as well as in the prevernal and serotinal seasons [Conete, 2017], the food factor cannot be qualified as a limiting factor of the bird flocks, as the passing periods are the same ones with the periods of abundant trophic offer in the area of these lakes. Though, the transit and stationary periods of different species of birds are affected by certain gaps under the influence of weather factors, of the climate changes and the anthropogenic pressure.

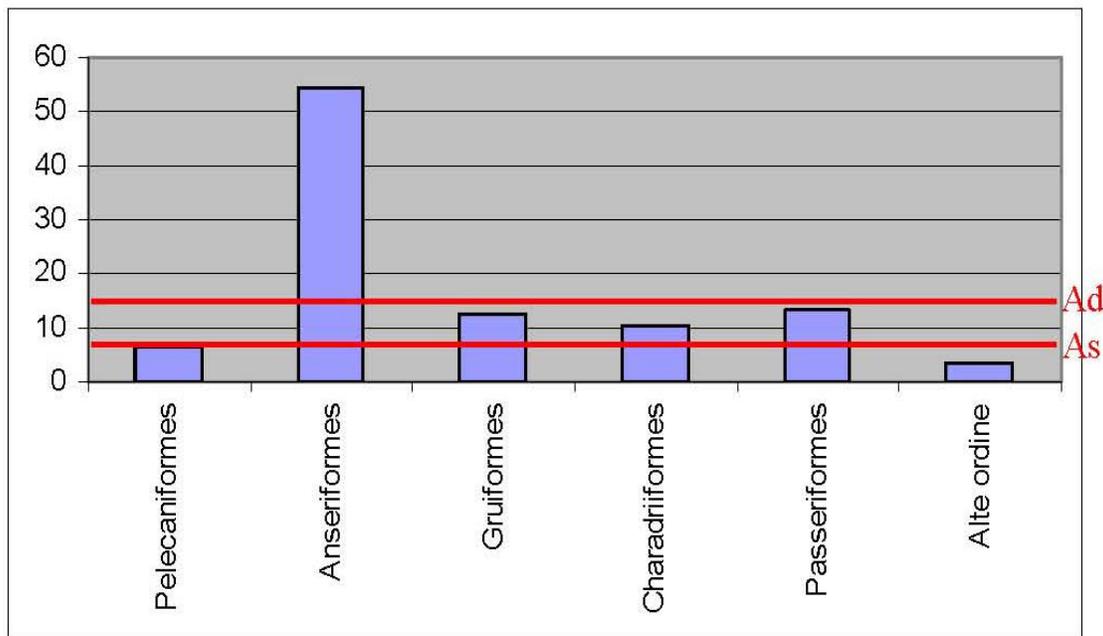


Fig. 3. The average global participation of the different orders in the avifauna of the autumnal season

Regarding the ecological indices (Fig. 4), the constancy value during the autumnal season, on the 5 reservoirs under research, 19 species representing 12,84% of the autumnal avifauna (*Phalacrocorax carbo*, *Tachybaptus ruficollis*, *Ixobrychus minutus*, *Egretta garzetta*, *Ardea cinerea*, *Anas platyrhynchos*, *Anas crecca*, *Aythya ferina*, *Gallinula chloropus*, *Fulica atra*, *Larus ridibundus*, *Larus cachinnans/michahellis*, *Streptopelia decaocto*, *Pica pica*, *Motacilla alba*, *Phylloscopus collybita*, *Parus major*, *Passer montanus*, etc.) were euconstant (C4), 15 species (10,14%, *Podiceps cristatus*, *Cygnus olor*,

*Nycticorax nycticorax*, *Aythya fuligula*, *Alcedo atthis*, *Turdus merula*, *Fringilla coelebs*, *Carduelis carduelis*, *Emberiza schoeniclus*, etc.) were constant (C3), 20 species (13,51%, *Phalacrocorax pygmeus*, *Anas querquedula*, *Accipiter nisus*, *Dendrocopos minor*, *Corvus corax*, *Arocephalus arundinaceus*, *Carduelis cannabina*, etc.) were accessory (C2) and 94 species (63,51%, *Podiceps grisegena*, *Pelecanus crispus*, *Ardeola ralloides*, *Aythya nyroca*, *Circus pygargus*, *Tringa erythropus*, *Aegithalos caudatus*, *Pyrrhula pyrrhula* etc.) were accidental (C1).

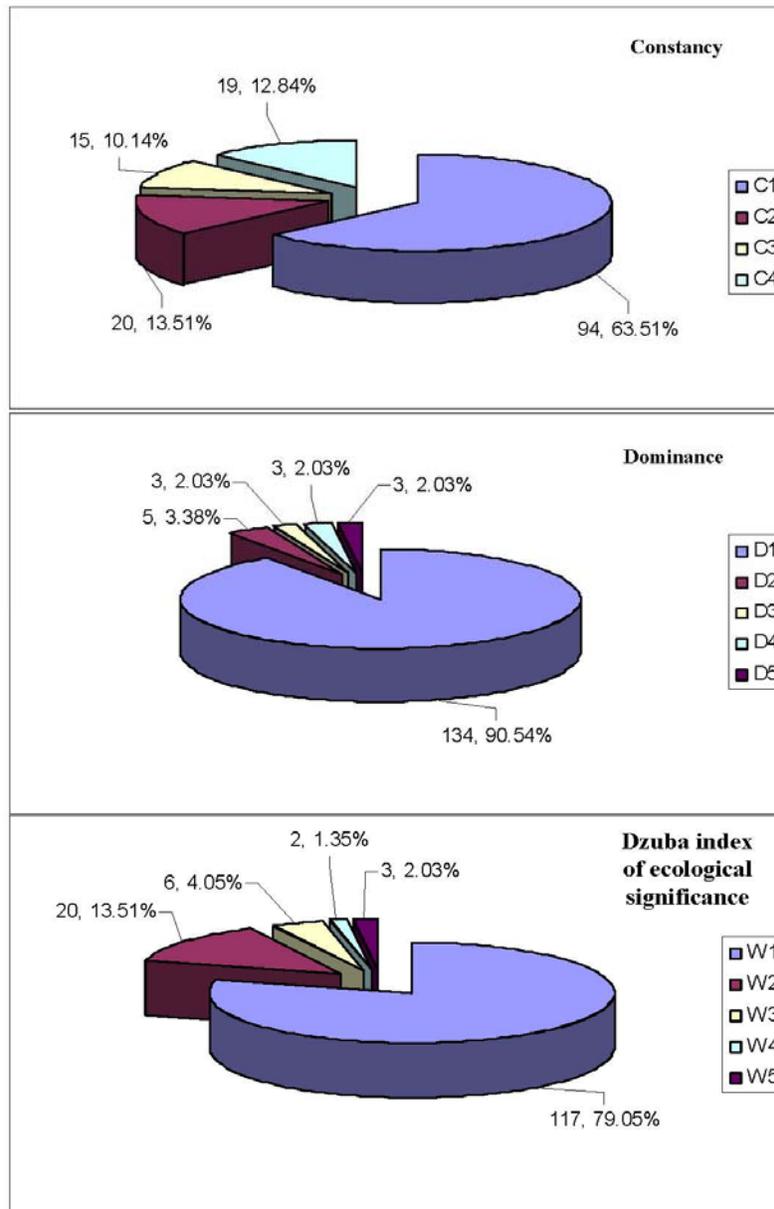


Fig. 4. The distribution on categories of the ecological indices of the avifauna in the studied reservoir areas during the autumnal season (Legend: C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species, D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species).

Regarding dominance, during the autumnal season, on the researched reservoirs, three species representing 2,03% (*Anas platyrhynchos*, *Aythya ferina*, *Fulica atra*) were eudominant (D5), three species (representing 2,03% of the total species that compose the autumnal avifauna - *Phalacrocorax carbo*, *Aythya fuligula*, *Larus ridibundus*) were dominant (D4), 3 species (2,03%, *Anas crecca*, *Larus cachinnans/michahellis*, *Sturnus vulgaris*) were subdominant (D3), 5 species (3,38%, *Tachybaptus ruficollis*, *Anser albifrons*, *Corvus monedula*, etc.) were recedent (D2), and 134 species (90,54%, *Gavia arctica*, *Podiceps griseogen*, *Phalacrocorax pygmeus*, *Aythya nyroca*, *Ardeola ralloides*, *Ixobrychus minutus*, *Numenius arquata*, *Dendrocopos minor*, *Dendrocopos medius*, *Certhia familiaris*, *Remiz pendulinus*, *Acrocephalus palustris*, *Emberiza schoeniclus*, etc.) were subrecedent (D1).

According to the Dzuba index of ecological significance, during the autumnal season, three species, representing 2,03% (*Anas platyrhynchos*, *Aythya ferina*, *Fulica atra*) were eudominant (W5), 2 species (1,35% %, *Phalacrocorax carbo*, *Larus ridibundus*,) were dominant (W4), 6 species (4,05%, *Tachybaptus ruficollis*, *Aythya fuligula*, *Larus cachinnans/michahellis*, *Sturnus vulgaris*, *Passer montanus* etc.) were subdominant (W3), 20 species (13,51%, *Podiceps cristatus*, *Nycticorax nycticorax*, *Cygnus olor*, *Gallinula chloropus*, *Alauda arvensis*, *Galerida cristata*, *Motacilla alba*, *Phylloscopus collybita*, *Parus caeruleus*, *Emberiza citrinella* etc.) were recedent (W2) and 117 species (79,05%, *Gavia arctica*, *Podiceps griseogen*, *Pelecanus crispus*, *Egretta alba*, *Anas penelope*, *Aythya nyroca*, *Netta rufina*, *Accipiter brevipes*, *Falco tinnunculus*, *Pernis apivorus*, *Calidris alpina*, *Charadrius dubius*, *Chlidonias niger*, *Coracias garrulus*, *Jynx torquilla*, *Ficedula hypoleuca* etc.) were subrecedent (W1).

Depending on the Dzuba index of ecological significance, we notice, during the autumnal season, in the area of the researched reservoirs, 5 characteristic species (eudominant and dominant): *Anas platyrhynchos*, *Aythya ferina*, *Fulica atra*, *Phalacrocorax carbo* and *Larus ridibundus*.

Generally, reservoirs are very attractive for the aquatic birds, during the migration periods and especially during winter, with a high population degree, phenomenon that was signaled by Munteanu, Mătieș, 1983, Kiss, 1999, Gava 1997, Gache, 2002, Mitruț, 2002, Conete, 2011, etc. for the aquatic basins in Banat, Moldova, Transilvania, Muntenia, etc.

## CONCLUSIONS

During the research, within the autumnal season, we have identified, in the area of the reservoirs on the middle basin of Arges River, 147 species belonging to 14 orders, 39 families, and 91 genera, 57 species are dependent on the wetlands. On the whole, during the autumnal season, the

Anseriformes order had been overdominant, and the Passeriformes, Gruiformes and Charadriiformes orders were dominant.

We can also notice, within this season, the autumnal agglomerations specific to the migration. Thus, the migration started during the serotinal season continues, as summer guest species leave the area in the favor of the winter guest species and of the passing ones. Compared to the serotinal season, the number of species is lower, but the number of individuals is far higher. Autumnal migration is much slower than the prevernal one, as birds tend to use for more time the territories that provide abundant trophic resources and shelter. We can also observe large migrations from a reservoir to another this season.

The high number of accidental species in the autumnal season (94 species) alongside the very large number, according to the Dzuba significance index, of subrecedent species (117 species) reflect the existence of a high variations of birds species in the area of the reservoirs (especially Anseriformes, Charadriiformes, Passeriformes, Falconiformes, Ciconiformes, etc.), as these reservoirs are located on the route of Rucăr – Bran Migration Corridor. Researched reservoirs represent, for the migrating aquatic birds, significant resting and feeding places during the migration, on their road from the nesting areas to the wintering locations, considered real resting and wintering oasis alongside the lower basin of the Danube, towards the Danube Delta and the basins of Olt, Mureș etc.

The attractiveness of the five reservoirs to the avifauna is different and dynamic, being firstly conditioned by the size of the water surface, the clogging degree, the heterogeneity of the habitats (meadow, grasslands, shrubbery, cultivated lands, orchards, deciduous forests, etc.) in the proximity of the researched reservoirs, and also by the anthropogenic influence and weather factors. Given these, the protection of the key species and of their habitats is absolutely mandatory, as they are true indicators of the ecosystems health and of the climate changes.

## ABSTRACT

In this paper, we present the results of our ecological research on the avifauna of reservoirs from the middle basin of the Argeș River, during the autumnal season. The autumnal season has been relatively rich in species (147 species belonging to 14 orders, 39 families and 91 genera); 57 species are dependent on wetlands. We also perform an analysis of the avifauna according to ecological indices. The Anseriformes were overdominant. During the autumnal season, as well as during the serotinal and the prevernal ones, according to the dominance and the Dzuba index of ecologic significance, 5 species were characteristic:

*Anas platyrhynchos*, *Aythya ferina*, *Fulica atra*, *Phalacrocorax carbo* și *Larus ridibundus*. During this season, we can observe evident autumnal agglomerations that are specific to migration, which continues the migration started during the serotinal season. The attractiveness of the five reservoirs for the fauna is different and dynamic, thus registering ample migrations from a reservoir to another. Researched lakes represent, for the migratory aquatic birds, important locations for resting and feeding during their cross over from the nesting areas towards the wintering shelters.

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